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## Marine eutrophication impacts from present and future production of spring barley

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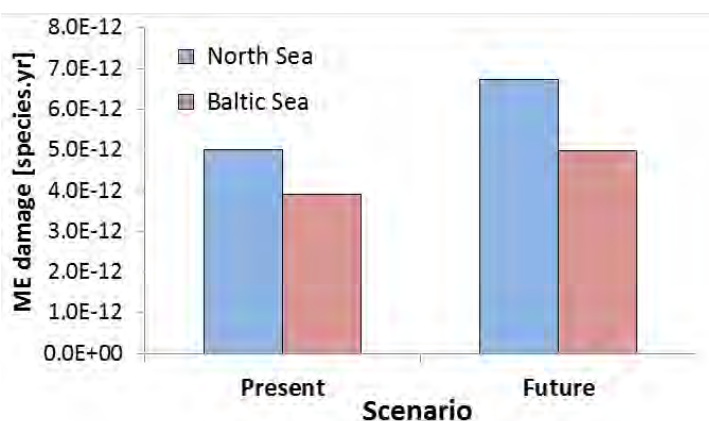
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Agricultural activity is the main driver for environmental emissions of nutrients. The need to increase its productivity to feed a growing population, the predicted increasing use of fertilizers, and future climatic pressures anticipate larger nutrient emissions to the environment. These originate from the surplus of fertilizers applied over plants assimilation and may cause freshwater (mainly phosphorus, P) and marine eutrophication (mainly nitrogen, N).

We applied the LC-IMPACT methodology <sup>(1)</sup> modified with recent developments <sup>(2)(3)</sup> to estimate the marine eutrophication impacts of N enrichment in a case-study that is representative of spring barley production in Denmark <sup>(4)</sup>. The modelled emission routes from the agricultural field compartment include airborne transport and deposition of volatile N-forms (NH<sub>3</sub> and NO<sub>x</sub>) and waterborne transport of N through freshwater systems, to the North Sea and Baltic Sea.

Emissions inventory data was also obtained for a scenario under future climatic conditions, with crop yields estimated from experiments mimicking a worst case climate scenario, i.e. double carbon dioxide concentration and 5°C temperature increase. Impact assessment of the future scenario was modified to represent the parameterization of expected changes in fate, exposure and effects modelling <sup>(5)</sup>.

Preliminary results of endpoint impacts (species.yr) <sup>(5)</sup> show 29% larger impacts to the Baltic Sea in the present scenario and an increase of 34% (North Sea) and 28% (Baltic Sea) in the future scenario. The results are justified by reduced agriculture yield <sup>(4)(6)</sup>, and increased emissions and species sensitivity <sup>(5)</sup>. Using LCA indicators we can estimate (the magnitude of) the effects of future climatic changes and anticipate (some of) the impacts, so that responses may be implement sooner. In this line, LCIA indicators give valuable information to decision support.



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